

# **CERTIFICATE OF COMPLIANCE FOR RADIOACTIVE MATERIAL PACKAGES**

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## 2 PREAMBLE

- a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."
- b. This certificate does not relieve the consignor from compliance with any requirement of the regulations of the U.S. Department of Transportation or other applicable regulatory agencies, including the government of any country through or into which the package will be transported

## 3 THIS CERTIFICATE IS ISSUED ON THE BASIS OF A SAFETY ANALYSIS REPORT OF THE PACKAGE DESIGN OR APPLICATION

### a. ISSUED TO (Name and Address)

EnergySolutions  
140 Stoneridge Drive  
Columbia, SC 29210

### b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Chem-Nuclear Systems, LLC, application dated  
March 22, 2000, as supplemented.

## 4 CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

## 5.

### (a) Packaging

(1) Model No.: CNS 10-160B

(2) Description

A cylindrical carbon steel and lead shielded shipping cask, designed to transport radioactive waste material. The cask is transported in the upright position and is equipped with steel encased, rigid polyurethane foam impact limiters on the top and bottom. The package has approximate dimensions, shielding, and weight as follows:

Cask height	88 inches
Cask outer diameter	78-1/2 inches
Cask cavity height	77 inches
Cask cavity diameter	58 inches
Overall package height, with impact limiters	130 inches
Overall package diameter, with impact limiters	102 inches
Lead shielding thickness	1-7/8 inches
Gross weight (packaging and contents)	72,000 lbs
Maximum total weight of contents, shoring, secondary containers, and optional shield insert	14,500 lbs

NRC FORM 618 Rev. 10-69		U.S. NUCLEAR REGULATORY COMMISSION			
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5.(a)(2) Description (Continued)

The cask body consists of a 1-1/8-inch thick carbon steel (ASME SA516 or SA537) inner shell, a 1-7/8-inch thick lead gamma shield, and a 2-inch thick carbon steel outer shell (ASME SA516). The inner and outer shells are welded to a 5-1/2-inch thick carbon steel bottom plate. The cask cavity has an optional 11-gage stainless steel liner. A 12-gage stainless steel thermal shield surrounds the cask outer shell in the region between the impact limiters. The impact limiters are secured to each other around the cask by eight ratchet binders.

The cask lid is a 5-1/2-inch thick carbon steel plate, and has a 31-inch diameter opening equipped with a secondary lid. The primary lid is sealed with a double elastomer O-ring and 24 equally spaced 1-3/4-inch diameter bolts. The secondary lid is 46 inches in diameter, is centered within the primary lid, and is sealed to the primary lid by a double elastomer O-ring and 12 equally spaced 1-3/4-inch diameter bolts. The space between the double O-ring seals is provided with a test port for leak testing the primary and secondary lid seals.

The optional cask drain and vent ports are sealed with a plug and an O-ring seal.

The package is equipped with four tie-down lugs welded to the cask outer shell. Two lifting lugs and two redundant lifting lugs are removed during transport. The lid is equipped with three lifting lugs which are covered by the top impact limiter and rain cover during transport.

An optional carbon steel shield insert may be used within the cask cavity.

(3) Drawings

The packaging is constructed and assembled in accordance with Chem-Nuclear Systems Drawing No. C-110-D-29003-010, Sheets 1 through 5, Rev. 13.

An optional shield insert is constructed in accordance with Chem-Nuclear Systems Drawing No. C-119-B-0018, Rev. 2.

5.(b) Contents

(1) Type and form of material

- (i) Byproduct, source, and special nuclear material in the form of solids, dewatered resins or process solids, or solidified waste, contained within secondary containers. Explosives, corrosives, non-radioactive pyrophorics, and compressed gases are prohibited. Pyrophoric radionuclides may be present only in residual amounts less than 1 weight percent. The total amount of potentially volatile organic compounds present in the headspace of a secondary container is restricted to 500 parts per million; or
- (ii) Radioactive material in the form of activated reactor components.

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5.(b) (2) Maximum quantity of material per package

Type B quantity of radioactive material, not to exceed 3,000 **times** a Type A quantity. Decay heat not to exceed 100 watts. Total weight of contents, **shoring**, secondary containers, and optional shield insert not to exceed 14,500 pounds. Contents may include fissile material contaminants provided the mass limits of 10 CFR 71.15, are **not** exceeded. Plutonium content not to exceed 0.74 TBq (20 curies).

6. Except for close fitting contents, shoring must be placed between the secondary containers or activated components and the cask cavity to prevent movement **during** accident conditions or transport.
7. The cask primary lid must be secured by 24, and the secondary lid **by 12**, 1-3/4"-8UNC x 5-3/8" long hex cap screws with a flat washer, torqued to 300 ft-lbs  $\pm$  30 ft-lbs (**lubricated**). The optional drain and vent port plugs must be torqued to 20  $\pm$  2 ft-lbs.
8. Lift lugs must be removed from the cask body prior to transport.
9. In addition to the requirements of Subpart G of 10 CFR Part 71:
  - (a) Each packaging must meet the Acceptance Tests and Maintenance Program of Chapter 8 of the application; and
  - (b) The package must be prepared for shipment and operated in accordance with the Operating Procedures of Chapter 7 of the application; and
  - (c) The primary lid, secondary lid, and the optional vent and drain seals must be replaced with new seals if inspection shows any defects or every 12 months, **whichever** occurs first.
10. The package must be leak tested as follows.
  - (a) Prior to each shipment, the package must be leak-tested in **accordance** with Section 8.2.2.2 of the application. For contents that meet the definition of **low** specific activity material or surface contaminated objects in 10 CFR 71.4, and also meet **the** exemption standard for low specific activity material and surface contaminated objects in **10** CFR 71.14(b)(3)(i), the pre-shipment leak-test is not required.
  - (b) The packaging containment system must be leak tested in **accordance** with Section 8.1.3 of the application prior to first use of any packaging, and after **the third** use.
  - (c) The packaging containment system must be leak tested in **accordance** with Section 8.2.2 of the application within the 12-month period prior to each use, **and** after seal replacement.

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11. (a) For any package containing water and/or organic substances which could radiolytically generate combustible gases, a determination must be made **by** tests and measurements or by analysis of a representative package that the following **criteria** are met over a period of time that is twice the expected shipment time.
- (1) The hydrogen generated must be limited to a molar **quantity** that would be no more than 5% by volume (or equivalent limits for other **inflammable** gases) of the secondary container gas void if present at STP (i.e., **no** more than 0.063 g-moles/ft<sup>3</sup> at 14.7 psia and 70°F); or
  - (2) The secondary container and cask cavity must be **inerted** with a diluent to assure that oxygen is limited to 5% by volume in those portions of **the** package which could have hydrogen greater than 5%.
- For any package delivered to a carrier for transport, **the** secondary container must be prepared for shipment in the same manner in which **determination** for gas generation is made. Shipment period begins when the package is **prepared** (sealed) and must be completed within twice the expected shipment time.
- (b) For any package containing materials with a radioactivity concentration not exceeding that for low specific activity material, and shipped within 10 days of **preparation**, or within 10 days after venting of drums or other secondary containers, the **determination** in (a) above need not be made, and the time restriction in (a) above does not **apply**.
- (c) For any package containing TRU the following additional **conditions** apply:
- (1) Waste content codes and classification, physical form, **chemical** properties, chemical compatibility, gas distribution, and pressure buildup, **container** and contents configuration, isotopic characterization and fissile **content**, must be determined and limited in accordance with Appendix 4.10.2 of the application;
  - (2) Each waste container must not exceed the decay heat **limits** in Section 10 of the applicable site specific appendix to Appendix 4.10.2, or **must** satisfy the requirements of Attachment B, "Methodology for Determination of Decay Heats and Hydrogen Gas Generation Rates for Transuranic Content Codes," for **each** site specific appendix to Appendix 4.10.2 as listed below:
 

Appendix 4.10.2.1	Compliance Methodology for TRU Waste From Battelle Columbus Laboratories,
Appendix 4.10.2.2	Compliance Methodology for TRU Waste From Missouri University Research Reactor,
Appendix 4.10.2.3	Compliance Methodology for TRU Waste From Energy Technology Engineering Center,
Appendix 4.10.2.4	Compliance Methodology for TRU Waste From Lawrence Livermore National Laboratory,

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## Appendix 4.10.2.5 Compliance Methodology for TRU Waste From Idaho National Engineering and Environmental Laboratory;

- (3) One or more filter vents must be installed in the drum payload container. Filter vents must meet the minimum specifications in Section 8, "Payload Container and Contents Configuration" of the applicable site specific appendix to Appendix 4.10.2; and
- (4) The payload containers authorized for shipment of TRU in the Model No. CNS 10-160B are the 30-gallon and the 55-gallon drum. Up to ten payload containers of TRU waste may be packaged in the cask.

12. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR 71.17.
13. Revision No. 11 of this certificate may be used until September 30, 2008.
14. Expiration date: October 31, 2010.

REFERENCES

Chem-Nuclear Systems, LLC, application dated March 22, 2000.

Supplements dated May 10 and November 7, 2000; and January 5 and April 13, 2001.

Duratek supplements dated April 23 and July 24, 2001, June 14, 2002, August 20, 2004, and March 7, April 8, October 26, December 2 and 7, 2005.

EnergySolutions supplements dated May 11, and July 18, 2007.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION



Robert A. Nelson, Chief  
Licensing Branch  
Division of Spent Fuel Storage and Transportation  
Office of Nuclear Material Safety  
and Safeguards

Date: September 26, 2007.



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

## SAFETY EVALUATION REPORT

Docket No. 71-9204  
Model No. CNS 10-160B Package  
Certificate of Compliance No. 9204  
Revision No. 12

### INTRODUCTION

By application dated May 11, 2007, supplemented July 18, 2007, *EnergySolutions* (the applicant) requested an amendment to Certificate of Compliance No. 9204, for the Model No. CNS 10-160B. The applicant requested the transfer of the certificate for the Model No. 10-160 B from Duratek to *EnergySolutions*; the addition of text that addresses subsequent shipment of payload containers that were originally qualified for shipment under the provisions of Condition No. 11 of the certificate; addition of alternative seal materials; and the addition of a leak test to demonstrate leak tight conditions using helium.

### GENERAL INFORMATION

By application dated May 11, 2007, and supplemented by additional information through letter dated July 18, 2007, *EnergySolutions* requested an amendment to Certificate of Compliance No. 9204 for the Model No. CNS 10-160B. *EnergySolutions* submitted the amendment request for approval of a revised certificate to reflect the proposed changes.

The applicant requested that the certificate for the Model No. CNS 10-160B package be transferred from Duratek to *EnergySolutions*. This change was a result of *EnergySolutions* acquiring Duratek in 2006. In the application, *EnergySolutions* stated that the Model No. CNS 10-160B package was maintained in accordance with the NRC approved Duratek Quality Assurance Program until May 31, 2007, when the *EnergySolutions* Quality Assurance Program became effective. There are no changes to the operation and maintenance of the Model No. CNS 10-160B package. Furthermore, *EnergySolutions* also accepts responsibility for maintenance of the certificate, the SAR for the package design, and the quality assurance records in accordance with the requirements of 10 CFR 71.91(c).

The proposed amendment adds text to Appendix 4.10.2 of the application to specify that TRU payload containers approved under this appendix and subsequently shipped to another site remain acceptable for shipping provided the payload container has not been opened.

The proposed change to the application includes replacement of currently used seal material from "silicone" to three types of "elastomer" material; Ethylene Propylene Rubber, Butyl Rubber, and Silicone Rubber. The seal material currently used is silicone rubber, Class 2A, Grade 50-70 which has a low temperature resistance to about -80° F and a high temperature resistance to approximately 425° F. In the application supplement the applicant showed that all three materials, Ethylene Propylene Rubber, Butyl Rubber and Silicone Rubber have maximum heat resistance temperature of 400° F. The amendment would change the maximum temperature for the proposed seal materials for both normal conditions of transport (NCT) and hypothetical accident conditions (HAC) to 400° F from 450° F based on thermal analysis.

The proposed amendment will add a periodic leak test to demonstrate leak tight conditions using helium. The periodic leak test is intended to demonstrate whether the leak-tight criterion per ANSI N14.5-1997 is met.

## STRUCTURAL EVALUATION

The applicant requested a change in seal material from silicone to elastomer. No other structural design changes were requested.

## THERMAL EVALUATION

The proposed amendment to the certificate includes replacement of currently used seal material from "silicone" to three types of "elastomer" material; Ethylene Propylene Rubber, Butyl Rubber, and Silicone Rubber. The seal material currently used is silicone rubber, Class 2A, Grade 50-70 which has a low temperature resistance to about -80° F and a high temperature resistance to approximately 425° F.

The applicant reports that all temperatures and stresses within the package due to NCT are within allowable service ranges for all components and materials used in the cask. Specifically, the seal temperature range from -40° F to 168° F and are within the required elastomer seal operating region of -40° F to 250° F. All structural materials are below their melting points.

Manufacturer's specifications, referenced in the "Parker O-Ring Handbook," and the TRUPACT-II test report, "Design Development and Certification Testing of the TRUPACT-II Package," show that all three materials have a maximum heat resistance temperature of 400° F. The maximum temperature of the seal material will not exceed the maximum calculated temperature of 252° F. The seal temperature is conservatively determined to be equal to the maximum calculated temperature of the cask body plus 100° F for an analyzed maximum of 352° F. Since the analyzed maximum seal temperature is set at 352° F, setting the seal temperature limit at 450° F unnecessarily restricted the options for the types of materials that can be used for seals. Therefore the maximum seal temperature limit for HAC is set at 400° F with a duration of one hour.

Based on the review of the statements and representations in the application for the amendment, the staff finds that the thermal design has been adequately described and evaluated and has a reasonable assurance that the package meets the thermal requirements of 10 CFR Part 71

## CONTAINMENT EVALUATION

The proposed amendment adds a leak test to demonstrate leak tight conditions using helium as an option for the periodic leak test. The proposed addition to the SAR, Section 4.9 *Periodic Verification Leak Rate Determination for Leak Tight Status*, describes the method for performing a periodic leak test to demonstrate that the criteria per ANSI N14.5 – 1997 for leak-tight requirements are met.

The test is performed with a mass spectrometer leak detector. Calibration of the leak detector shall be performed using a leak rate standard traceable to NIST. The leak standard's setting shall correspond to the leak-tight leak test rate acceptance criterion of  $1.0 \times 10^{-7}$  atm-cm<sup>3</sup>/sec of air. The detector sensitivity is less than or equal to  $5.0 \times 10^{-8}$  atm-cm<sup>3</sup>/sec. The test is

conducted by evacuating the cask cavity to a 90% vacuum, then pressurizing the cask cavity with helium to +1 psig – 0 psig. The annulus between the O-rings is evacuated until the vacuum is sufficient to operate the helium mass spectrometer leak detector and the helium concentration in the annulus is monitored. The monitored leak rate must satisfy the leak criterion specified in proposed Section 4.9 of the application. If installed, the vent and drain lines will be tested using the above procedure by evacuating and pressurizing the inlet (cavity) side of the lines and monitoring the helium concentration at the outlet side of the cap screw. The applicant agrees that for any condition that results in leakage in excess of the leak criterion, it shall be corrected before the use of the cask.

As part of the general procedure for loading and unloading of the Model No. CNS 10-160B package, the applicant will perform leak testing as specified in Section 8.2.2.1 of the application when the seals are replaced (including seals on the optional vent and drain ports). The test shall be performed prior to acceptance and operation of a newly fabricated package, in accordance with ASTM E-427 using halogen leak detector or ASME E-499 using helium leak detector depending on the test gas used. The detector shall be capable of meeting the applicable sensitivity requirements specified in Figures 4.4, 4.8 or 4.12 in Chapter 4 of the application. Calibration of the leak detector shall be performed using a leak test rate standard traceable to NIST. The detector probe shall be moved along the interior surface of the inner seal according to the specifications of ASTM E-427 or ASME-499.

As part of the periodic maintenance, the package shall be leak tested as described in Section 8.1.3 of the application after its third use. In addition, the containment system, before actual use for shipment, shall have been leak tested according to Section 8.1.3, or to leak-tight leak test described above within the preceding 12-month period.

Based on the review of the statements and representations in the application for an amendment, the staff finds that the containment design has been adequately described and evaluated and has a reasonable assurance that the package meets the regulatory requirements for containment design.

## CONCLUSION

Condition No. 5(a)(2) was revised to show that the seal material is elastomer. Condition No. 5(a)(3) was changed to reflect Revision 13, as the latest version of Drawing No C-110-D-29003-010. Conditions No. 10(b) was revised, and Condition No. 10(c) was added for clarity regarding leak testing.

Based on the statements and representation contained in the application, as supplemented, the staff concludes that the Model No. 10-160B package meets the requirements of 10 CFR Part 71.

Issued with Certificate of Compliance No. 9204, Revision No. 12,  
on September 26, 2007.